

Table S1: Analytical Investigation of the Joint SECAP Plans

Plans	Adaptation strategy			Subjects and tools for coordinating and implementing the adaptation actions	Feasibility and synergy in the adaptation actions	Participatory processes and communication activities implemented
	Identification of knowledge, risks, and impacts	Objectives and priorities	Adaptation actions			
Unione Tresinaro Secchia Joint SECAP	<p>References: National Framework and Regional Climate Change Policy; climate data from Emilia Romagna Regional Environmental Protection Agency (Agenzia regionale per la protezione ambientale, ARPA).</p> <p>Vulnerabilities/Risks Droughts and water shortages; Floods; Heavy rainfall; Landslides; Fires.</p> <p>The impacts and related vulnerabilities identified on the national and regional levels are cross-referenced with the information available for the Unione dei Comuni Tresinaro Secchia.</p>	<p>Objective 1: Adaptation to temperature increases</p> <p>Objective 2: Fighting overuse of water</p> <p>Objective 3: Preserving land quality</p> <p>Objective 4: Forecasting hydrogeological risk</p> <p>Objective 5: Limiting waterproofing</p> <p>Objective 6: Increase in forested areas and green area management</p> <p>Objective 7: Preventing the deterioration of cultural goods</p> <p>Refinement of the objectives in reference to two territorial areas: - larger hilly area: - larger plain area</p>	<p>Action 1.1: Actions for adaptation and cooling in the urban area (buildings and open spaces)</p> <p>Action 2.1: Actions to reuse and recover water</p> <p>Action 2.2: Replacing, where possible, crops with others that use less water</p> <p>Action 2.3: Actions to reduce waste</p> <p>Action 3.1: Actions to promote agricultural practices that favour the reduction of processing, etc.</p> <p>Action 4.1: Continuous updating of the local climate monitoring system</p> <p>Action 4.2: Actions for continuous/biannual verification of the cleanliness of rivers and canals</p> <p>Action 4.3: Actions to prevent and monitor landslides</p> <p>Action 5.1: Depaving actions</p> <p>Action 5.2: Actions to limit land consumption in urban-planning tools undergoing revision</p> <p>Action 6.1: Actions for greening and forestation</p> <p>Action 7.1: Actions and projects to secure buildings and make conservative restorations</p>	<p>- Activation of a technical working group among the municipalities in the Unione to share the Joint SECAP path.</p> <p>- Meetings with stakeholders to define a path to construct the Joint SECAP</p>	<p>The actions identified present different levels of detail and identify possible further insights and integrations through interaction with the stakeholder working groups.</p> <p>Each action sheet contains references to: - description of the action; - responsible subjects; - stakeholders; - possible impacts; - collaboration with other projects and plans by the entities themselves or promoted by others; - monitoring system and the related indicators; - available resources and supply entities.</p>	<p>Preparation of a communication plan to support the path leading to the approval of individual Joint SECAPs and subsequent public presentations.</p>

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Terre estensi Joint SECAP inter-municipality association	<ul style="list-style-type: none"> - Characterization of the climate in the area in question; - Short- and long-term future climate scenarios; - Vulnerability and risk analysis for the territory of interest; <p>Vulnerabilities:</p> <ul style="list-style-type: none"> - Heat waves - Cold snaps - Floods - Extreme precipitation - Wind storms/tornadoes - Droughts - Fires - Increasing yearly average temperature - Reduction of total annual precipitation <p>Risks</p> <ul style="list-style-type: none"> - Urban overheating - Limited water availability - Damage to crop lands/changes in agricultural yields - Alteration of ecosystems - Increase in climate-sensitive illnesses - Damage to buildings and the historical/cultural heritage - Endurance of infrastructure - Physical risks for people 	<p>Identification of territorial areas of particular interest in relation to their vulnerability and importance under the environmental, economic, and social profiles</p> <ul style="list-style-type: none"> -Alpine and Apennine areas -Po district. 	<p>The proposed adaptation actions were also developed in accordance with the indications in the National Climate Change Adaptation Strategy</p> <p>25 Actions regarding: increasing temperatures, decreased rainfall, and an increase in extreme weather events.</p> <p>Actions:</p> <ul style="list-style-type: none"> - Water risk prevention - Smart water network - Drought observatory - Mettiamoci in (idro)rete - RAINBO project - Sustainable irrigation - Un'altra agricoltura - Adattiamoci - Mangiatoie sulle mura - Ecological networks - PROTECH2SAVE project - Demolizione? Sì, grazie - Resilient public buildings - Networks vs climate change - Resiliencw centre - Verde Binario - Città Giardino - PERFECT project - Containing land consumption - Civil Protection - Uffa che afa - Tourism 365 - Un centro di verde - Peri-urban agriculture - First aid -AdapTPL 	<p>Protocol of understanding between the public administration and private parties.</p> <p>As the leader, the City of Ferrara is committed to coordinating the work and activities, raising awareness, and informing stakeholders about climate change adaptation issues, sharing actions and steps to prepare periodic statements on the progress of the Joint SECAP, and supporting subjects present in the territory.</p> <p>The signatories of the protocol are committed to working with the City. At the same time, private parties are asked to provide public administrations with information on their planned interventions, monitoring the results.</p>	<p>Each action is illustrated through a specific action sheet.</p> <p>The action sheet contains:</p> <ul style="list-style-type: none"> - a description of what is envisaged and all information relating to the definition of responsibilities and implementation methods (timing, costs, monitoring, actors involved). 	<p>Activation of focus groups and preliminary sessions to present the shared path (participation of managers and municipal service technicians; energy operators; organizations representing economic and trade parties; mobility operators).</p> <p>Co-definition of interconnected frameworks, contexts, and future project actions for climate mitigation and adaptation.</p>

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Venezia Orientale Resiliente Joint SECAP	<p>Vast area plans; municipal-scale tools; operational tools for adaptation; National climate reference framework (PNACC)</p> <p>Importance of risks with reference to the sector:</p> <ul style="list-style-type: none"> - buildings; transport; - energy; - water; waste; - territorial planning; - agriculture and forestry; - environment and biodiversity; - health; - civil protection and rescue; - tourism. <p>Risk and Vulnerability Assessment:</p> <ul style="list-style-type: none"> - heat waves - cold snaps - extreme precipitation - floods - rising sea levels - droughts - storms - landslides - fires <p>Risk levels: low, moderate, high</p>	<p>Objectives for large uniform areas according to environmental characteristics, settlement dynamics, and socioeconomic identities;</p> <p>Local planning indications, but also common lines of action for similar areas, thus working in an integrated manner.</p> <p>Objectives:</p> <ol style="list-style-type: none"> 1. Recovering the landscape of the reclaimed land, making it sustainable and suitable for slow tourism. 2. Reduction of water-related hazards 3. Good agriculture practices. <p>Sustainable cultivation for responsible use of resources and preserving soil fertility.</p> <ol style="list-style-type: none"> 4. Forestation in areas with a higher degree of risk 5. Planning new information and risk management Tools. 	<p>Actions are identified per sector and on three levels: for individual municipalities; for large uniform areas — coastal areas, Portogruaro, and Sandomatese; and for entire territories of the 22 municipalities.</p> <p>List of primary actions for adaptation</p> <p>For mobility: masterplan of eastern veneto – cyclable; management of transport services bicycles (e.g. ‘interbike ii’ project);</p> <p>For tourism: psl 2014-20 punti superficie linee - environmental tourism itineraries</p> <p>For territorial planning: implementation metropolitan city sitm; water plans; pat – building regulation – intervention plan;</p> <p>For environment and biodiversity: forest area management association of the plains; river contracts; veneta coast contracts; wet area contracts; ridiamo il sorriso alla pianura padana; urban forestation; species/habitat management in green infrastructures (e.g. ‘engreen’ project); regional park management (‘terre dell’acqua/terre risorgive’ project); marine ecosystem management (e.g. ‘fishing for future’ project). for civil protection: updating civil protection plans;</p> <p>For water: flood monitoring (e.g. visfrim project); implementation of integrated coastal area management guidelines initiatives of the local interregional assembly ‘ausir’ initiatives of the basin council ‘laguna di venezia’ management of rainwater collection points</p> <p>For agriculture and forestry: enhancement of good practices in agriculture; biodistrict biovenezia; agro-ecological transition of viticulture (e.g. ‘ecovinegoals’ project)</p> <p>viticulture emissions balance (e.g. ‘winezero’ project); support For organic farms (e.g. ‘territori bio’ project)</p> <p>natural environmental enhancement</p> <p>For agriculture: agriculture (e.g. ‘r.a.i.v.o.’ project); enhancement of the ‘sustainable tourism landscape’ regulation for pesticide use;</p> <p>For waste: circ. economy – communication</p> <p>For good practices: veneto agenda 2021-2027; resilience manager; ‘adriaclima’ project on climate scenarios. etc.</p>	<p>The group of municipalities (22) has a highly organized coordination structure: the lead municipality coordinates relations between the political/administrative bodies (Steering Committee) and technicians (Technical Commission).</p> <p>All actors in the administration rely on external public and private support structures that provide consultation, technical assistance, and appropriate staff training in the different areas of the PAESC. Among these: Metropolitan City of Venice, external appointed technical consultants, and VeGAL.</p> <p>Several coordination meetings to establish: priority mitigation and adaptation actions, ways of activating and monitoring them, the timeframes, responsibilities and tasks, the subjects involved, and the necessary economic resources.</p> <p>The project envisages the establishment of an Area Resilience Manager charged with coordinating and promoting SECAP negotiation/promotion actions on behalf of private subjects operating in the territory.</p>	<p>Each sheet contains: the objective, description, implementing policy tool, sponsor; stakeholders; impacts, vulnerabilities, and risks addressed; effects on mitigation; estimated costs, implementation period, and monitoring</p>	<p>In the start-up phases of the SECAP formation activities, the administrations expressed the willingness to build a plan for communication and involvement. The Metropolitan City held training start-up activities (aimed at both technicians and administrators) and subsequent in-depth activities related to SECAP.</p> <p>The administrations have also acted to search for appropriate moments of interaction with other competent territorial authorities and stakeholders. The moments for review and monitoring set out in the SECAP allow for a continuous improvement of the process.</p> <p>Pact signatories agree to submit a biennial ‘Implementation Report’ following the submission of the SECAP ‘for evaluation, monitoring, and verification purposes’. In conjunction with these activities, the municipalities will inform citizens of the results obtained and the state of health of the territory. A significant part of the actions in the plan are also aimed at activating non-structural actions (referred to in the plan as ‘indirect actions’) that testify to the desire to continuously and permanently involve and empower local residents.</p>

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Valle dell'Agno (Aggregation of municipalities) Joint PAESC	<p>Descriptions of the natural context of each municipality; Demographic trends; Wind; Economic activities</p> <p>Climate adaptation; European context; European Strategy on Adaptation to Climate Change; National Climate Change Adaptation Strategy (SNAC)</p> <p>Climate change Analysis of temperature and precipitation</p> <p>Risk and vulnerability assessment:</p> <ul style="list-style-type: none"> - Hydrogeological imbalance - Precipitation and flooding - Droughts and heat waves - Loss of biodiversity and degradation of the natural environment 	<p>The primary goal of the adaptation actions is to identify concrete activities that can increase resilience regarding the critical issues identified for each of the main sectors already facing the challenge of climate change. These may be summarized in four categories of intervention: passive defence, active defence, insurance defence, and abandonment. They regard:</p> <ul style="list-style-type: none"> - Hydrogeological imbalances - Precipitation and flooding - Droughts and heat waves - Loss of biodiversity 	<p>With regard to hydrogeological imbalances, the actions for adaptation concern:</p> <ul style="list-style-type: none"> - Urban-planning regulations and territorial planning - Green areas and reforestation - Data mapping and sharing - Rainwater management in urban areas <p>With regard to precipitation and flooding;</p> <ul style="list-style-type: none"> - Detention basin in the Municipality of Trissino - Urban-planning regulations and territorial planning - Green areas and reforestation - Rainwater management in urban areas <p>With regard to droughts and heat waves:</p> <ul style="list-style-type: none"> - Raising the awareness of citizens and students - Promotion and resilience of agricultural production <p>With regard to the loss of biodiversity:</p> <ul style="list-style-type: none"> - Raising the awareness of citizens and students - Green areas and reforestation - Promotion and resilience of agricultural production 	<p>Collaboration of different sectors of the municipal administration, both technical and political. With respect to monitoring and management of the SECAP after approval and also following possible changes in the organization, the offices that will have to be activated and coordinated are, in particular</p> <ul style="list-style-type: none"> - Public works; - Urban planning; - Environment; - Accounting. <p>Planned technical and political meetings</p>	<p>The sheets contain a description of the intervention; the area of reference; the objectives; the responsible subjects; the timeframe; and the intervention costs.</p>	<p>Meetings with stakeholders and citizens were planned in order to:</p> <p>Promote the SECAP and define certain actions in agreement with local actors (in particular, companies and bodies in the area and schools).</p> <p>Promote SECAP among the population by explaining its related issues and possible future actions.</p>

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Vesuviano (Aggregation of municipalities) Joint SECAP	<p>General European and national frameworks. Italy and the PNIEC 2030.</p> <p>Local cognitive framework:</p> <ul style="list-style-type: none"> - Geological, geomorphological, and hydrogeological aspects of the territory - Weather-climate aspects of the territory <p>Risks:</p> <ul style="list-style-type: none"> - hydrogeological risk: flooding - risk of heat waves - risk of prolonged drought <p>Vulnerable areas: based on the risks, identification of 'vulnerable areas' and possible 'priority actions for adaptation'.</p>	<p>Medium- to long-term objectives on hydrogeological risk:</p> <ul style="list-style-type: none"> - Recovery of river dynamics (where possible): ecological regeneration of rivers - Natural water retention measures (NWMR) - Returning space to the rivers - Territorial control <p>Empowering residents</p> <p>Purification through decentralized systems (e.g. phyto-purification) and compatible reuse</p> <ul style="list-style-type: none"> - Reclamation <p>Systematization of information and dissemination in a form comprehensible to citizens</p> <ul style="list-style-type: none"> - Accountability for sustainable use etc. <p>Long-term objectives for 'droughts and lack of water':</p> <ul style="list-style-type: none"> - Containing withdrawals from the deep water table. - Ensuring an adequate flow rate (minimum ecological flow) of surface water even in critical periods. - Promoting efficiency in the civil water distribution network and recovering at least half of the network losses - Pursuing policies to reduce domestic water consumption to values of 100 litres/inhabitant/day - Reduce consumption of drinking water for non-domestic use, etc. <p>Medium- to long-term objectives on 'heat wave risk':</p> <ul style="list-style-type: none"> - Adopt a municipal regulation for public and private green areas - Identifying and promoting tree species that are better able to adapt; - Encourage projects for the widespread generation of public green areas; - Designing and implementing 'green roofs' – Encourage private individuals (households and businesses) to plant on private property, etc. 	<p>The action sheets are structured according to 'critical issues' and 'sectors of intervention'. One or more action sheets were defined for each sector of intervention</p> <p><i>Field of action:</i></p> <p>Extreme rain and flooding:</p> <ul style="list-style-type: none"> - Slowing runoff and promoting the absorption of rainwater; - Municipal emergency plan and interventions in high-risk areas; <p>etc.</p> <p><i>Field of action:</i></p> <ul style="list-style-type: none"> - Hydrogeological imbalance and surface water pollution - River contract and major project for the Sarno River <p><i>Field of action:</i></p> <ul style="list-style-type: none"> - Decreasing water consumption - Recovery of stormwater for various uses and saving drinking water - Recovery of drinking water losses from the city aqueduct etc. <p><i>Field of action:</i></p> <ul style="list-style-type: none"> - Heat waves and urban microclimate - Reforestation and urban regeneration - Protecting the population at risk of heat waves. <p>Web portal of public green areas</p> <p><i>Field of action:</i></p> <ul style="list-style-type: none"> - Preventing extreme events - Creation of a weather-climate monitoring network in all municipalities - Priority actions for adaptation <p>Identification of vulnerable areas and possible 'priority actions for adaptation'.</p>	<p>Protocol of understanding between the public administration and stakeholders (individuals or associations).</p> <p>The municipalities are committed to:</p> <p>a. Coordinating work and activities between the different thematic groups (environment, energy, transport, sustainable mobility, culture, etc.) and the different institutional levels (region, province, basin authority, civil protection, municipalities);</p> <p>b. Providing an 'information desk' (UCSA OneStopShop) for all stakeholders on the issues of climate change adaptation and energy savings; acting as a catalyst for calls for tenders and funding, in particular from the EU.</p> <p>c. Sharing actions and steps to prepare and implement the action sheets by periodically reporting on the progress;</p> <p>d. Supporting area subjects in coming together and moving their own initiatives forward.</p> <p>The signatories of the protocol are committed to:</p> <p>a) Working with the City and other stakeholders involved in achieving the objectives of the SECAP.</p> <p>b) Publicizing the actions promoted, the projects undertaken, the results obtained.</p> <p>Creation of an Integrated Management System (IMS) of municipalities to implement the actions in the SECAP.</p>	<p>The sheets are organized into: objectives; period of implementation risks avoided; cost estimates; competent entities; beneficiaries/entities involved; monitoring indicators</p> <p>- The annual SECAP report should state the progress of work in the action sheets and possibly allow for improvements and corrections</p> <p>- Annual SECAP/UN SDG report</p> <p>This annual report plays a key role in measuring the effectiveness of SECAP 2030 as outlined in the UN SDGs. The sheets are designed as operational and indicative tools and are therefore susceptible to adaptation to change (in standards, technology, planning, and regulations) that may occur during the long period of SECAP implementation (2020–2030) Some of these may also be fully implemented within planning (PUC) and regulatory (RUE) tools</p>	<p>Three key moments are expected:</p> <p>1) Involvement of the city's governance structure and the various municipal sectors and offices in all plan tools, projects, and ongoing programmes (including and especially European ones).</p> <p>2) Involvement of the main 'actors' (stakeholders) belonging to the different sectors (industrial production, agriculture, schools of all levels, wholesale and small distribution, transport system, environment, cultural and social associations), acting in the area as both 'solution bearers' and 'beneficiaries' of the actions themselves.</p> <p>3) 'Participatory' drafting of action sheets (not only a list of possible, technologically feasible actions, but also and especially identifying: the key players, costs, timeframes, and regulatory/cultural/economic barriers and how to overcome them).</p> <p>The training and information capacity of the SECAP to be promoted in the territory, also and especially through the 'energy and sustainability desk' in interaction with stakeholders and citizens in general</p>

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Riviera delle Palme Joint PAESC	<p>Identification of 73 RISKS:</p> <p>27 INCREASING TEMPERATURES heat waves, spread of harmful insects and alien species, increasing risk of fire</p> <p>6 DECREASING PRECIPITATION reduction of water availability</p> <p>40 EXTREME EVENTS river flooding, urban flooding, coastal flooding, strong wind, cloudbursts, hail, increase in landslide risk</p>	<p>23 ADAPTATION OBJECTIVES</p> <p>7- PROMOTE ADAPTATION TO INCREASING TEMPERATURES</p> <p>2- PROMOTE ADAPTATION TO THE REDUCTION OF WATER AVAILABILITY</p> <p>9- PROMOTE ADAPTATION TO INCREASING FREQUENCY OF EXTREME EVENTS</p> <p>5 – CROSS-CUTTING OBJECTIVES OF ADAPTATION</p>	<p>ADAPTATION ACTIONS</p> <ul style="list-style-type: none"> - BUILDING - ENERGY - TRANSPORT - WASTE - INDUSTRY - OTHER SECTORS <p>Stakeholder priorities</p> <p>WATER Adaptation of the sewer network Adaptation of the water network Monitoring and maintaining bodies of water Pilot interventions for reusing and recovering water resources</p> <p>AGRICULTURE AND FORESTRY Adaptation of the irrigation network Resilient Agriculture desk</p> <p>NATURAL ENVIRONMENT AND BIODIVERSITY Interventions to protect and defend the coast BUILT ENVIRONMENT Interventions for sustainable urban drainage Interventions for urban reforestation Interventions in areas at risk of landslides</p> <p>EDUCATION 'Let's Adapt' campaign 'Save the Water' campaign</p> <p>CIVIL PROTECTION AND FIRST AID Optimizing the civil protection system Strengthening early alert systems</p> <p>PLANNING Adaptation of municipal regulations Activation of green infrastructure planning tools Promotion of river and coastal contracts</p> <p>TOURISM Year-round tourism</p>	<p>Consultation with stakeholders was a central part of the planning process, from the initial stages to its conclusion. A group of experts acted as facilitators within 3 focus groups that worked to identify the risks, objectives, and actions. The focus groups were followed by bilateral meetings with the individual administrations involved, with whom in-depth comparisons were made to effectively identify and describe the actions in the plan. Seven actions address the reduction of the risk of river flooding, the main one being Monitoring and maintenance of bodies of water (A-ACQ-03), integrated with sustainable drainage (A-EDI-01) and supported by two cross-cutting territorial-planning actions (A-PIA-01 – Adapting municipal regulations, and A-PIA-03 – Promoting River and Coastal Contracts).</p>	<p>The eighteen actions for overall adaptation selected by stakeholders regarded one or more climate phenomena. Among actions to reduce risks related to extreme events, the group of actions regarding urban flooding prevails: Adaptation of the drainage network (A-EDI-01) and urban forestation(A-EDI-02). Twenty-seven percent of the actions instead regard rising temperatures. In particular, reducing the effects of heat waves is addressed by 10 actions, which cross-reference all sectors.</p>	<p>Participation in the plan process The plan process is based on three central steps:</p> <ul style="list-style-type: none"> • Identification of climate RISKS in the territory • Identification of the OBJECTIVES that the plan aims to reach • Identification of the ACTIONS to pursue these objectives. <p>Three essential steps, developed through a process of involving the local community, which actively participates in identifying and prioritizing the RISKS-OBJECTIVES-ACTIONS.</p> <p>Consultation in the area with numerous local actors in addition to the four administrations.</p> <p>The participation process is therefore an element permeating the entire process, from the initial stages of acquisition and discussion of critical issues and climate risks present in the territory, to the final stage of preparing the list of interventions that the municipalities intend to develop. The resulting list of actions is shared deeply.</p>